

Claims

1. A computer-implemented method for monitoring variations in the film build thickness of workpieces on which a film build process has been performed, comprising the steps of:

measuring the film build thickness of a group of workpieces, the group comprising at least two subgroups of workpieces, each subgroup including at least two workpieces;

calculating the range of the film build thickness measurements of each subgroup, each range comprising the difference between the greatest thickness measurement and the least thickness measurement of the subgroup;

selecting data from at least two of said subgroups having the smallest of the calculated ranges; and

monitoring variations of the film build thickness of subsequent workpieces coated in the film build by processing the data from the selected subgroups.

2. A method as defined in claim 1, including the step of calculating upper and lower control limits from the calculated ranges of the selected subgroups.

3. A method as defined in claim 1, including the step of calculating upper and lower control limits for the film build process after each group of 20 subgroups has been measured.

1 4. A method as defined in claim 1, including the step of calculating upper and
2 lower control limits after the film build thickness of each additional subgroup has been
3 measured, and including the latest 20 subgroups for selecting the subgroups having the
4 smallest of the calculated ranges.

Sub
a.
2 5. A method as defined in claim 1, including the step of measuring the film
build thickness of the corresponding surface area on a group of similar workpieces.

1 6. A method as defined in claim 1, including the step of measuring the film
2 build thickness of the corresponding surface area on a group of similar workpieces that
3 have been coated with a film in the same painting booth.

1 7. A method as defined in claim 1, including the step of measuring the film
2 build thickness of the corresponding surface area on a group of similar workpieces that
3 have been coated with a film in the same color group.

1 8. A method as defined in claim 1, including the step of measuring the film
2 build thickness of the corresponding surface area on a group of similar workpieces that
3 have been coated within the same time frame.

1 9. A method as defined in claim 1, including the step of calculating the
2 change in quantity of film build material being used in the film build process by

3 substituting new process control limits for existing process control limits, the new
4 process control limits having been calculated from the ranges of the selected
5 subgroups.

1 10. A method as defined in claim 1, including the step of calculating the
2 change in cost of film build material being used in the process by substituting new
3 calculated process control limits for existing process control limits, the new process
4 control limits having been calculated from the ranges of the selected subgroups.

1 11. A method as defined in claim 1, including the step of calculating C_{pk} based
2 on the ranges of the selected subgroups.

1 12. A method as defined in claim 1, including the step of calculating a film
2 build average thickness from data selected from the selected subgroups.

1 13. A method as defined in claim 9, including the steps of calculating the
2 difference in C_{pk} for the new process control limits and the existing process control
3 limits, and then calculating the change in film build material usage from the difference in
4 C_{pk} .